Correlation of Cancer Rates and Radon Levels

Jerome Puskin
Director, Center for Science and Risk Assessment
U.S. EPA Office of Air and Radiation (OAR)/Office of Radiation and Indoor Air (ORIA)/Radiation Protection Division (RPD)
(202) 343-9212
puskin.jerome@epa.gov

Authors: Jerome Puskin
U.S. EPA OAR/ORIA/RPD

Keywords: radon, cancer, smoking, LNT

Inhaled radon decay products irradiate the bronchial epithelium, leading to an increased incidence of lung cancer, as shown by epidemiological studies of underground miners and experiments on radon-exposed rodents. The extensive epidemiological data on miners were used by a U.S. Environmental Protection Agency (U.S. EPA)-sponsored committee (BEIR VI) at the National Academy of Sciences to develop mathematical models that the U.S. EPA uses for projecting risks from radon exposure in homes. Nevertheless, some have questioned whether the relatively low exposures normally occurring in homes are carcinogenic. One study has shown a negative correlation between lung cancer mortality and average residential radon levels across the United States (Cohen, 1990). This finding has not only raised questions about risks from residential radon, but has also been more generally cited as evidence against the linear, no-threshold theory (LNT) of carcinogenesis, which the U.S. EPA widely applies in assessing risks from chemicals as well as radiation. In this study, correlations between residential radon levels and various types of cancers are examined. A similar negative correlation is found for a variety of smoking-related cancers in addition to lung cancer, but not for cancers unaffected by smoking. It is concluded that the observed negative correlations between radon and cancer mortality most likely arise from confounding by smoking and do not imply any deviation from the LNT. Recent data from residential case-control studies provide further confirmation of the lung cancer risk from indoor radon. Together, these findings substantially increase the credibility of the U.S. EPA's public outreach program aimed at reducing radon in homes. This work was conducted by the author during a detail to the National Cancer Institute (NCI), where he collaborated with statisticians and other technical experts at NCI to develop these results.